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Sexual function, depressive symptoms and marital status in nonseminoma testicular cancer patients: a longitudinal study

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Abstract

Goal: To longitudinally investigate sexual functioning in testicular cancer patients during the first year, and examine the effect of relationship status (with a partner or single) and depressive symptoms on sexual functioning.

Patients and methods: 93 testicular cancer patients (39% single) treated in two large referral centers for testicular cancer filled in the International Index of Erectile Function (IIEF) and CES-D after orchiectomy (T1) and 3 (T2) and 12 (T3) months later.

Results: Orgasmic functioning, overall satisfaction and total sexual functioning decreased between T1 and T2 and increased to an above T1 level at T3. Levels of erectile functioning and intercourse satisfaction were higher at T3 than at T1 and T2. Desire remained stable. Type of treatment did not affect sexual functioning. Singles reported worse sexual functioning at all measurement times than committed patients, and comparable desire. One year after surgery, singles also reported worse sexual functioning on three domains when compared with norms. Depressive symptoms were highest and significantly but weakly related to one domain of sexual functioning at T1, to three domains at T2, and to none at T3. Early depressive symptoms had small to moderate predictive power on sexual functioning at T2, but not at T3.

Conclusion: Sexual functioning, but not desire, fluctuates during the first year after testicular cancer. Type of treatment and depressive symptoms were no risk factors for sexual dysfunction in the longer term. Singles reported more sexual problems than patients in a relationship and norms, they may need more information and guidance concerning their sexuality. Copyright © 2009 John Wiley & Sons, Ltd.

Keywords: testicular cancer; sexual functioning; longitudinal; depressive symptoms; relationship status

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Introduction

Testicular cancer is rare (1% of new cancer diagnoses in men), but the most frequent malignancy in young men aged between 15 and 40 years. The highest incidence lies around 30 years of age. Testicular cancer is highly curable, with approximately 95% of men surviving the disease [1,2]. Sexual functioning in testicular cancer patients and survivors has received attention before. This is not surprising, as this type of cancer involves an organ associated with sexuality, and strikes at a young age when sexuality is of great importance. Testicular cancer patients can experience sexual problems after diagnosis and completion of treatment, which in combination with other physical and

psychological consequences, can affect global quality of life [3,4].

Previous research shows that a varying percentage of testicular cancer survivors suffer from several physical sexual problems such as ejaculatory failure, orgasmic problems, and erectile dysfunction (all reported up to 40%) [5–7]. In contrast, some studies showed that the prevalence of erectile dysfunction after testicular cancer is similar to that found in the general population [3,8]. In addition to physical sexual problems, a considerable percentage of survivors also report psychosexual dysfunction after treatment like decreased desire, decreased sexual activity and dissatisfaction. Sexual dysfunction was reported to persist for up to 2 years after treatment, after

which functioning seems to recover [5,6]. A major pitfall of most studies is that they suffer from methodological shortcomings such as using standardized questionnaires, normative data or retrospective measurements [5,6]. A more recent study did compare sexual functioning in testicular cancer survivors to functioning in a norm group [9]. Results indicated that survivors experienced more problems with sexual drive, erection and ejaculation than men in the norm group. However, young survivors (20–39 years) reported more sexual satisfaction than their normative counterparts. It remains unclear why some survivors develop and continue to have sexual problems, while others do not. It is therefore useful to gain insight to possible risk factors for the development of sexual dysfunction.

A possible risk factor might be the relationship status of patients. In general, married men appear to experience a better quality of life than single men, and this might include sexual functioning as well [10]. As testicular cancer patients are relatively young, a significant number will not yet have established a steady relationship and is therefore single. Most studies indicated that around 70% of participating testicular cancer survivors was in a committed relationship when diagnosed [11]. A review study indicated that little attention has been paid to the effect of relationship status on functioning in testicular cancer patients and survivors [12]. The few studies that addressed this subject showed that testicular cancer survivors in relationships established after completion of treatment reported less sexual satisfaction than men in the general population, and than testicular cancer survivors who had the same partner as at the time of diagnosis [13]. It was also found that testicular cancer survivors who did not have a partner were more likely to report sexual problems, defined by drive, erection and ejaculation problems, or a satisfaction problem compared with survivors who did have a partner [9]. Contradictory to these findings was the finding that sexual functioning in testicular cancer patients was similar in men with a partner and singles. However, married men seemed somewhat more worried about changes in their appearance and attractiveness, and an earlier study found that 24% of married survivors perceived themselves to be less attractive as a result of their treatment [14,15]. These contradictory findings make it of interest to take relationship status as a risk factor into account for sexual dysfunction.

A second risk factor may be depression. It has been suggested that the emotional impact of testicular cancer may be a more important predictor of sexual dysfunction than objective physical and treatment aspects [5,16]. Psychosexual functioning seems to be affected by the experience but independently of type of treatment [5,9,16–18]. Psychological responses to diagnosis and treatment

should therefore be taken into account when studying sexual functioning. However, very little attention has been paid to the relationship between emotional distress and sexual dysfunction in this group [6]. Depressive symptoms are prevalent in cancer patients, with reported rates varying between 15–and 24% [19,20]. Depression appears to be prevalent in 9–11% of testicular cancer survivors up to 5 years after treatment completion [21] and is unrelated to age at diagnosis, type of treatment or marital status at diagnosis. Depression is well known to be related to sexual dysfunction, with the majority of (not cancer related) depressed patients reporting sexual dysfunction. It is associated with decreased libido, decreased frequency of intercourse, erectile dysfunction and delayed or absent orgasm, independent from use of antidepressant drugs [22]. A study on long-term testicular cancer survivors (median number of years since treatment 3.9) showed that severely impaired sexual functioning was related to more depression and fatigue [18].

To advance on existing research, the present two-center study focused on sexual functioning in testicular cancer patients during the first year after orchiectomy (removal of the affected testicle), using standardized questionnaires. The effect of relationship status, type of treatment and depressive symptoms on sexual functioning were taken into account. Main research aims were to examine: the trajectory of sexual functioning during the first year after removal of the affected testis; differences in sexual functioning on the basis of type of treatment received and relationship status; the effect of depressive symptoms on sexual functioning concurrently and prospectively.

Methods

Patients and procedure

This study was part of a larger study on the possible negative effects of chemotherapy after testicular cancer. As chemotherapy is a treatment option after diagnosis of non-seminomatous testicular tumors, only patients with this diagnosis were included. Two patient groups diagnosed with a non-seminomatous testicular tumor were approached for participation.

The first group consisted of all patients referred to the University Medical Center Groningen (UMCG) in The Netherlands for treatment between April 2001 and March 2004. Exclusion criteria were age younger than 18 years at study entry, a psychiatric illness or history involving formal thought disorders, insufficient command of the Dutch language, prior neurologic illness, and previous treatment for cancer. The study was approved by the Medical Ethics Committee of the UMCG. The second group consisted of all patients

consecutively visiting the MD Anderson Cancer Center (MDACC) in Houston, TX for treatment between December 1999 and December 2002. The study was approved by the Institutional Review Board of the MDACC. Exclusion criteria were age younger than 18 years at study entry, a psychiatric illness or history, insufficient command of the English language, inability to give informed consent, prior neurologic illness, and an extragonadal germ cell tumor.

Orchiectomy is both therapeutic and diagnostic: a conclusive diagnosis of testicular cancer results from pathology assessment of the removed testicle. Therefore, the study was introduced to patients after orchiectomy in both institutions. Patients received oral and written information about the study from co-workers of the study, together with an informed consent form. Patients who agreed to participate, received a self-report questionnaire at three time points: after orchiectomy but before the start of chemotherapy (T1), immediately after chemotherapy completion or 3 months after T1 (T2), and 1 year after T1 (T3). At both hospitals T1 and T2 questionnaires were completed in the hospital. At the MDACC patients filled in the T3 questionnaire at the hospital as well, at the UMCG T3 questionnaire and a prepaid return envelope were sent to the patients' home address.

Instruments

Information on age, educational level, daily occupation, proposed type of treatment and relationship status (dichotomized into the categories 'with a partner' (married or in a committed relationship) and 'single') were collected at T1. Daily occupation was dichotomized into the categories 'employed for wages' (including self-employed) and 'not employed for wages' consisting of students, being unemployed, and being unable to work. On T3, information on type of treatment received was retrieved from the patients' medical files. Dutch educational level was measured on a 7-point scale: 'Elementary school' (1), 'Lower technical/vocational degree' (2), 'High school-low level' (3), 'Middle level technical/vocational degree' (4), 'High school-high level' (5), 'Higher technical/vocational degree' (6), and 'University degree' (7). American educational level was measured on a 7-point scale also, using the following levels: 'Never received a high school diploma/GED' (1), 'High school diploma/GED' (2), 'Technical/vocational degree' (3), 'Some college level credits or 2 years college degree' (4), 'Bachelors degree' (5), 'Masters degree' (6), and 'M.D., Ph.D., or advance degree' (7). Because both countries measured education according to a 7-point scale, and higher scores indicated more years of education we treated education level as a continuous variable. Type of treatment consisted of orchiectomy only,

orchiectomy and chemotherapy, or orchiectomy, chemotherapy and resection of residual retroperitoneal tumor mass (RRRTM). Patients of the UMCG group received four cycles of bleomycin, etoposide and cisplatin (BEP), with a 3-week interval between each cycle. Chemotherapy regimen in the MDACC group ranged from one to seven cycles, depending on stage, tumor markers, and response. BEP was the most commonly administered regimen, but several patients received CISCA/VB (cyclophosphamide, adriamycin, cisplatin, vinblastine, and bleomycin), or BOP (vincristine, bleomycin, and cisplatin)/CISCA/POMB (vincristine, methotrexate, and bleomycin)/ACE (etoposide, actinomycin, and cyclophosphamide). Strategies for treatment following chemotherapy are comparable at the UMCG and the MDACC. All patients with disseminated testicular cancer and residual disease after chemotherapy with masses > 1 cm on a CT scan underwent an exploratory laparotomy and RRRTM [23]. All patients with a mature component in the primary testicular tumor underwent an exploratory laparotomy as well to ensure that all potential metastatic disease was resected [24].

Sexual functioning was measured using the International Index of Erectile Function (IIEF), a widely used, multi-dimensional self-report instrument for the evaluation of male sexual function [25,26]. The IIEF consists of five subscales: erectile function (six items), orgasmic function (two items), sexual desire (two items), intercourse satisfaction (three items), and overall satisfaction (two items), and provides a total score (sum of all items). Normscores are available from 109 male volunteers (mean age 55 years, range 29–76) without a history of sexual dysfunction. Items were scored with different value labels on a 5- or 6-point scale, and 9 items were scored 0 when the patient had not been sexually active. A mean score for each subscale was calculated and higher scores indicated better functioning. Reliability of the IIEF in the UMCG group was adequate for all subscales (α s ranged from 0.86 to 0.98 over the three measurement times). Reliability for the IIEF in the MDACC group was good for all subscales (α s ranged from 0.86 to 0.95 over the three measurement times), except for the α for orgasmic function at T3, which was somewhat lower (0.69).

Depression was measured with the center for epidemiological studies—depression scale (CES-D), a 20-item questionnaire that measures depressive symptoms during the past week. Items are scored on a 4-point scale ranging from seldom or never (0), sometimes or a little (1), regularly (2), to most of the time or always (3). Scores are summed, resulting in a possible total score ranging from 0 to 60. A score of 16 or above suggests clinically significant depressive symptoms. The CES-D shows good internal validity and reliability

[27], also in cancer patients [20]. In the present study Cronbach's α s for the UMCG group ranged from 0.89–0.91, and for the MDACC group from 0.88–0.91.

Statistical analyses

Independent measures *t*-tests and χ^2 test were performed to examine differences in sociodemographics and type of treatment between patient groups according to nationality and relationship status. The cut-off score of the CES-D was used to identify patients who were experiencing clinically significant depressive symptoms. Repeated measures analyses of variance were computed to examine change over time in the five domains of sexual functioning and depressive symptoms; firstly with relationship status and secondly with type of treatment (three groups) as between-group factor. Relevant covariates were entered to control for differences between groups. Independent *t*-test was performed to examine differences between sexual functioning of respondents at T3 and that of the normgroup. Effect sizes were calculated using Cohen's *d* to assess the clinical significance of differences found over time and of comparison with norm. Effect sizes lower than 0.20 indicate negligible differences, effect sizes between 0.20 and 0.50 indicate a small difference, and those between 0.50 and 0.80 a moderate difference. A large effect size (≥ 0.80) can be seen as a clinically important difference [28].

Partial pearson correlations were used to examine relationships between sexual functioning and depressive symptoms, concurrently (within time, T1 depressive symptoms with T1 sexual functioning, etc.) and prospectively (T1 depressive symptoms and T2 and T3 sexual functioning, controlling for T1 sexual functioning), controlling for relationship status. By controlling for levels of the dependent variable at T1, inferences can be made about the direction of the causal influence.

Results

Population

Of the 70 patients diagnosed with testicular cancer during the inclusion period in the Netherlands, 12 (17%) did not meet the inclusion criteria, and 3 were approached to late after orchiectomy. Six patients decided not to participate (response = 90%). These non-participants did not differ in age from participants, but they did in treatment modality. All non-participants received chemotherapy, whereas a fourth of participants received surgery only. After T1, 9 of the 49 (18%) patients did not participate on all measurement times, which means that complete data were available from 40 out of 64 eligible patients. At the

MDACC, all patients with a possible diagnosis of testicular cancer ($n = 280$) seen in the genitourinary clinic were systematically screened. Of these, only 100 were eligible based on our eligibility requirements. Other reasons include not being newly diagnosed, extragonadal primary, brain metastases, too old or young, bilateral tumors, and positive history of a major head injury. Seventy-six patients consented to participate of whom 53 completed all assessments (response = 76%, 30% dropout). The MDACC received no approval to collect clinical and detailed sociodemographic data from patients who chose not to participate in this study. Therefore, no comparison between participants and non-participants was possible. In total, data of 93 patients were analyzed.

Sociodemographic and treatment-related variables

Mean age of all patients at T1 was 29.4 years (standard deviation (SD) = 7.5), ranging from 18 to 50 years. Educational level completed varied from primary school to advanced university degree, most patients (30%) had a technical vocational degree or some years of college. Of the patients, 74 (80%) were employed for wages. Of the 19 who were not, 14 were students, 3 were unemployed, and 2 were unable to work. At T3, twenty-four patients (26%) had been treated with orchiectomy alone, 41 (44%) with orchiectomy and chemotherapy, and 28 (30%) were treated with additional RR+. More than half of the patients were married or cohabiting, 39% was single. (Table 1) Singles appeared to be younger ($t = -4.0$, $p < 0.001$) and more often unemployed ($\chi^2 = 12.3$, $p < 0.001$) than patients with a partner.

Preliminary analyses

It may be that differences exist between Holland and the United States with respect to organization of health care, education and work as well as for social norms regarding dating behaviour and establishing relationships. Analyses showed that relationship status and employment status were comparable in the two countries. Minor differences were found with respect to age (UMCG patients were somewhat younger than MDACC patients ($t = -2.0$, $p < 0.05$)), educational level (MDACC patients finished higher levels of education ($\chi^2 = 12.8$, $p < 0.05$)), and type of treatment (UMCG patients more often receiving additional abdominal surgery ($\chi^2 = 11.4$, $p < 0.01$)). Repeated measures analyses of variance with between-subject factor nationality showed differences in erectile function ($F = 6.2$, $p = 0.015$), sexual desire ($F = 3.9$, $p = 0.049$), and overall satisfaction ($F = 12.4$, $p = 0.001$) at some, but not all time points. There were no significant interactive effects of nationality

Table 1. Sociodemographics at T1 and type of treatment received at T3

	Total group N = 93		MDACC N = 53		UMCG N = 40		Norm n = 109
Age (years) mean, (SD)	29.4 (7.5)		30.8 (7.7)		27.6 (6.8)		55
Range	18–50		18–51		18–43		29–76
Educational level N (%)							
1	3	3%	3	6%	—	—	—
2	14	15%	10	19%	4	10%	—
3	12	13%	4	8%	8	20%	—
4	28	30%	15	28%	13	32%	—
5	23	25%	16	30%	7	18%	—
6	9	10%	2	4%	7	18%	—
7	4	4%	3	6%	1	2%	—
Relationship status N (%)							
Single	36	39%	32	60%	15	38%	—
Partner	57	61%	21	40%	25	68%	—
Employment status N (%)							
Employed for wages	74	80%	41	77%	33	83%	—
Not employed for wages	19	20%	12	23%	7	17%	—
Type of treatment N (%)							
Surgery	24	26%	12	23%	12	30%	—
Surgery+CT	41	44%	31	58%	10	25%	—
Surgery+CT+RRTM	28	30%	10	19%	18	45%	—

SD, Standard Deviation; CT, chemotherapy; RRTM, resection of residual retroperitoneal tumormass.

and time. To account for these differences found and for other potential cultural covariates, a nationality variable was retained in subsequent analyses.

Effect of time on sexual functioning

Significant time effects were found on erectile function, orgasmic function, intercourse satisfaction, overall satisfaction and the total score. Inspection of the mean scores showed that levels of erectile function and intercourse satisfaction were comparable at T1 and T2, but higher at T3. Orgasmic function, overall satisfaction and the total score followed a positive quadratic trajectory, meaning that begin and end scores rise above the center point. Levels decreased between T1 and T2, and increased to an above T1 level at T3. Effect sizes of statistically significant changes over time were negligible indicating that changes were not clinically significant (Table 2).

Effect of relationship status

Repeated measures analysis of variance with between-subject factor relationship status and covariates age and employment status, indicated a significant group effect on erectile and orgasmic function, intercourse and overall satisfaction, and the total score but not on level of desire. Singles reported worse functioning than committed patients over the year. Effect size for the difference in intercourse satisfaction was small, and differences in the other domains were negligible (Table 2). There was a significant interactive effect of time and relationship status on sexual desire ($F = 7.4$, $p < 0.01$) and overall satisfaction ($F = 7.3$, $p < 0.01$),

indicating that desire and overall satisfaction changed over time in different ways for single and committed patients. Inspection of the mean scores showed that singles reported higher levels of desire at T1 and T3 (not significant) than committed patients, and a comparable level at T2. Singles experienced significantly lower overall satisfaction as compared with committed patients at all measurement times, with the difference being greatest at T1. With respect to the covariates employment status and age, some effects were found. Employment status appeared to have an effect on orgasmic function ($F = 5.5$, $p < 0.05$), sexual desire ($F = 6.7$, $p < 0.05$), intercourse satisfaction ($F = 4.8$, $p < 0.05$) and the total score ($F = 4.3$, $p < 0.05$). Age appeared to have an effect on sexual desire only ($F = 8.1$, $p < 0.01$). These covariates contribute differently to sexual functioning as relationship status, but based on the size of the F -values found, relationship status outweighs these effects.

Effect of treatment

Repeated measures analysis of variance, with between-subject factor treatment, showed no significant group effect or interactive effect of group and time on any aspect of sexual functioning (Table 2).

Comparison with norm at T3

One year after diagnosis, sexual functioning of patients did not differ from norms, except for one aspect: patients reported less overall satisfaction ($t = 2.8$, $p < 0.01$) than norms (mean = 8.6, SD = 1.7). The clinical relevance of this difference

Table 2. Descriptives on sexual functioning and repeated measures analyses of time and group effects

	T1	T2	T3	Effect	F	p	Effect size
	Mean (SD)	Mean (SD)	Mean (SD)				
Erectile function	21.6 (9.7)	21.0 (10.3)	24.1 (7.9)	Time	4.8	0.03	0.05
				Group: relationship status	26.5	0.000	0.19
				Group: treatment	0.9	ns	
Orgasmic function ^a	7.8 (3.5)	6.9 (4.1)	8.4 (3.0)	Time	8.7	0.004	0.09
				Group: relationship status	6.9	0.01	0.08
				Group: treatment	2.1	ns	
Sexual desire	6.9 (1.9)	6.8 (2.1)	7.3 (1.7)	Time	3.9	ns	
				Group: relationship status	0.33	ns	
				Group: treatment	1.4	ns	
Intercourse satisfaction	8.2 (5.7)	7.9 (5.8)	10.0 (5.0)	Time	7.7	0.007	0.08
				Group: relationship status	29.1	0.001	0.26
				Group: treatment	1.2	ns	
Overall satisfaction ^a	7.7 (2.3)	7.1 (2.2)	7.9 (1.8)	Time	10.7	0.002	
				Group: relationship status	10.2	0.002	0.12
				Group: treatment	1.0	ns	0.10
Total ^a	53.4 (19.0)	50.3 (21.8)	58.2 (16.0)	Time	7.2	0.009	0.08
				Group: relationship status	14.4	0.001	0.16
				Group: treatment	2.0	ns	

ns, not significant.

^aquadratic.

appeared small according to the effect size ($d = -0.4$; 95% confidence interval (ci): -0.7 to -0.12). Patients in a committed relationship differed from norms only on intercourse satisfaction: patients reported more satisfaction ($t = -2.2$, $p < 0.05$) than norms (mean = 10.6, SD = 3.9). The clinical relevance of this difference appeared small according to the effect size ($d = 0.33$; ci: 0.0–0.66). Singles reported worse erectile function ($t = 3.3$, $p < 0.01$) than norms (mean = 25.8, SD = 7.6), less intercourse satisfaction ($t = 3.0$, $p < 0.01$), and less overall satisfaction ($t = 2.6$, $p < 0.01$). The clinical relevance of these three differences was moderate according to effect sizes (erectile function: $d = -0.70$, ci: -1.08 to -0.34 ; intercourse satisfaction: $d = -0.74$, ci: -1.1 to -0.36 ; overall satisfaction: $d = -0.56$, ci: -0.93 to -0.19).

Depressive symptoms and sexual functioning

Depressive symptoms were highest at T1 (mean 11.6, SD 8.9) and decreased over time (T2: mean = 9.9, SD = 8.6; T3: mean = 7.9, SD = 7.8) ($F = 20.6$, $p < 0.001$). The change over time was, however, negligible according to the effect size (0.18). At T1, 24 patients (26%) reported clinically significant depressive symptoms, at T2, 14 patients (15%), and at T3, 15 patients (16%) did. Pearson's product moment correlation coefficients between Times 1 and 2 ($r = 0.58$), Times 2 and 3 ($r = 0.65$), and Times 1 and 3 ($r = 0.58$) depressive symptoms were significant and strong. At T1, more single patients (44%) reported clinically significant depressive symptoms than committed patients (14%) ($\chi^2 = 10.7$, $p < 0.001$), but percentages were

not significantly different at T2 (11 and 18%, respectively) and T3 (17 and 16% respectively). The percentages of patients reporting clinically significant depressive symptoms did not differ between the two treatment groups at T2 and T3 (treatment was similar for all patients at T1), or between nationalities.

Partial correlations (controlled for relationship status) were performed to examine concurrent and prospective relationships between depressive symptoms and sexual functioning. At T1, depressive symptoms were negatively related to one of the six subscales of sexual functioning: weakly to overall satisfaction ($r = -0.28$, $p < 0.01$). At T2, depressive symptoms were negatively and weakly related to erectile function ($r = -0.21$, $p < 0.05$), moderately strongly related to overall satisfaction ($r = -0.36$, $p < 0.001$), and negatively weakly to the total score ($r = -0.21$, $p < 0.05$). At T3 no significant correlations were found. Three significant prospective effects of T1 depressive symptoms on T2 levels of sexual functioning were found: for erectile function ($r = -0.24$, $p < 0.05$), overall satisfaction ($r = -0.33$, $p < 0.01$) and the total score ($r = 0.23$, $p < 0.05$). For T3 no significant prospective effects were found (Table 3).

Discussion

This longitudinal study focused on functional and psychological sexual functioning in testicular cancer patients during the first year after orchiectomy, and on possible differences in sexual functioning according to relationship status and depressive

Table 3. concurrent and prospective relationships between depressive symptoms and sexual functioning

CES-D	Concurrent			Prospective	
	T1	T2	T3	CES-D and T2 sexual functioning	CES-D and T3 sexual functioning
	<i>r</i>	<i>r</i>	<i>r</i>	Partial <i>r</i> ^a	Partial <i>r</i> ^a
Erectile function	−0.20	−0.21*	−0.10	−0.24*	0.01
Orgasmic function	−0.13	−0.15		−0.15	0.01
Sexual desire	−0.18	−0.16	−0.08	−0.11	0.01
Intercourse satisfaction	−0.10	−0.12		−0.16	0.02
Overall satisfaction	−0.28**	−0.36***	−0.23*	−0.33**	−0.20
Total	−0.20	−0.21*	−0.10	0.23*	−0.01

^acontrolled for T1 depressive symptoms and relationship status.

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$.

symptoms. It appeared that sexual functioning after testicular cancer fluctuates during the first year after orchiectomy, but depressive symptoms are no risk factors for sexual dysfunction. Singles however did report more sexual problems than committed men.

Testicular cancer patients experienced changes in all aspects of sexual functioning, except in desire. Apparently, in this group of young male cancer patients, desire in sexual activity seems unaffected by the cancer experience, at least during the first year. The other aspects of sexual functioning changed over the year, but according to different patterns. Orgasmic functioning, overall satisfaction and total sexual functioning changed according to a u-shaped pattern. Patients reported decreased functioning 3 months after removal of the affected testicle (which is the ending of chemotherapy cycles for 75% of patients), followed by an increase in sexual functioning to above baseline level 1 year after diagnosis. Erectile functioning and intercourse satisfaction were comparable directly following orchiectomy and 3 months later, and patients reported improvement to above baseline level after 1 year. When compared with norm scores, patients only reported less overall satisfaction. Clinical relevance of this decreased satisfaction appeared to be small. However, even though most aspects of functioning were comparable to that of a norm group, this finding may be a cause of concern as the norm group is an average of 25 years older.

A similar pattern was reported previously by Fosså and colleagues, who conducted a prospective study with men diagnosed with metastatic testicular to examine the effects of various chemotherapy approaches on multiple functional domains, including functional status. Their findings also indicated that sexual functioning may be negatively impacted after a testicular cancer diagnosis, but tends to improve over time, regardless of treatment [29]. It is possible that physical complaints, psychological distress and recuperating from surgery negatively affected sexual functioning, and

that functioning improved after the patient was treated and responding well and the immediate threat was over. A comparable pattern was found when testicular cancer survivors were asked to rate their psychological functioning at the time of study, and in retrospect prior to treatment and 6 months after treatment [30]. Apparently, both from a retrospective as well as prospective view, patients assess the months following end of treatment as most stressful. It must be noted that even though sexual functioning showed a decrease after treatment, the overall change over the year was not clinically significant according to effect sizes.

The present study showed that type of treatment was unrelated to sexual functioning, which is in line with previous studies on sexual functioning and quality of life of testicular cancer patients [5,8,12,16,17,31]. However, in other studies testicular cancer patients reported worse functioning on various quality of life domains, like physical function and fatigue immediately after completion of chemotherapy [29,32]. Perhaps increased underlying fatigue, which we did not include in the present study, can explain the decreased orgasmic functioning, overall satisfaction and total sexual functioning at 3 months after orchiectomy.

The current study did show that relationship status plays a role in explaining sexual functioning. Single testicular cancer patients reported worse sexual functioning over the year as compared with patients with a partner in all but one aspect, namely desire. Even though differences between single patients and those in a relationship were statistically highly significant, effect sizes indicated that the differences were not clinically significant. It is likely that single men have intercourse less frequently than committed men. Not being sexually active can result in lower scores in the IIEF on erectile functioning and intercourse satisfaction, and that can partly account for the difference between single and committed patients for these aspects. While the desire to be sexually active was the same in both groups (again underlining the idea that desire is unaffected by the experience with

cancer), singles evaluated their actual functioning as worse. When compared with a norm group 1 year after surgery, singles also reported less overall satisfaction, worse erectile functioning, and less intercourse satisfaction. Effect sizes were on the verge of being clinically relevant for the latter two, suggesting that functioning on these aspects is a problem for singles. Men in a steady relationship at the time of diagnosis often experience increased intimacy with their partners [13,14,33], possibly buffering negative feelings and consequences of their treatment for testicular cancer. The finding that patients in a relationship reported more intercourse satisfaction than men in the norm group may reflect this increased intimacy. Singles might experience more insecurity about their physical functioning because they miss this intimacy of a relationship. A second factor that may explain the difference between single and committed patients might be fertility distress. Infertility is a main concern for testicular cancer patients and survivors, eventually affecting approximately 30% of survivors [34]. Even though sperm banking is quite common before start of treatment, and infertility can be assessed only after trying to actively conceive for 1 year, concerns about infertility may haunt testicular cancer patients in the first year after diagnosis. The testes are associated with feeling strong and potent, and the possibility of reproductive failure seems to decrease the idea of a masculine identity [35,36]. Concerns about possible infertility have been found to negatively affect sexuality and sexual functioning, especially in singles, who might question whether they will find a partner [35].

The second possible risk factor for sexual dysfunction examined was depression. Depression was most prevalent directly following orchiectomy, with 26% suffering from clinically elevated levels indicating that they probably need professional care. Later on in the year this percentage dropped to 16 and is comparable to that found in an earlier study [30]. Directly following orchiectomy, 44% of the singles reported clinically elevated levels of depressive symptoms as compared with 14% of patients in a relationship, later on in the year no differences were found. Being unmarried was also found to be a risk factor for elevated depressive symptoms in breast cancer patients [37]. Single testicular cancer patients might lack the support a partner may offer during the most stressful period of their illness, as men have been found to usually draw the most support from their partner [38].

Shortly after orchiectomy, when depressive symptoms were most prevalent, depression and overall satisfaction were found to be related for only one domain. Men who experienced more depressive symptoms reported having less overall satisfaction directly following orchiectomy. However, 3 months later, three domains of sexual

functioning were found to be related. Men who experienced more depressive symptoms reported having a worse erectile function, less overall satisfaction and a lower overall sexual functioning at this time. A year after diagnosis depressive symptoms appeared unrelated to sexual functioning. Depressive symptoms seemed to have predictive power in later sexual functioning, but only 3 months after diagnosis. Depressive symptoms at the time of diagnosis appeared to be predictive of erectile function, overall satisfaction and overall sexual functioning 3 months later. A year after diagnosis no such predictive relationships were found. Apparently, depressive symptoms are a possible risk factor for sexual problems only several months after diagnosis. Shortly after diagnosis and 1 year later, depressive symptoms are unrelated to sexual functioning. It might be that testicular cancer patients are trying to return to normal life when active treatment is over. At that time, remaining depressive symptoms might be most disturbing, also for sexual functioning. Positive finding is that a year after diagnosis depressive symptoms have decreased to normal levels and appear to play no role in sexuality, at least, not in testicular cancer patients.

This study has several limitations. Firstly, no information was available on the functioning of patients who declined to participate. They may have been those who were functioning best or worst, the results may have been biased in either direction. Secondly, although nationality was controlled for in the analyses, it might be that differences in social norms regarding sexuality between America and the Netherlands may influence participants' responses to the sexual functioning items. A larger study including patient groups from several countries can address cultural influences on sexuality after testicular cancer better than a two-site study. On a related note, the chemotherapy regimens offered at UMCG and MDACC were not identical, and the number of participants in each of cells was not equal (i.e. there were fewer participants who received orchiectomy alone vs orchiectomy plus chemotherapy). While we attempt to control for relevant site and treatment variables in our analyses, cell size imbalances may have influenced our ability to describe the effect between chemotherapy and sexual function. Finally, comparisons with the norm group should be made cautiously. In addition to being older than the testicular cancer patients, the norm group consisted only of men of unknown relationship status from North America. Thus, detailed comparisons were not possible.

Major strengths of the study were, however, the use of a prospective study design, and the use of a standardized, well-validated measure of sexual function. Different designs of studies on sexual functioning generates different findings. It was

found earlier that an assessment made by patients retrospectively indicated considerable sexual deterioration after surgery for benign prostatic disease, whereas a prospective assessment showed little impact [39], possibly due to recall bias of the respondents. It is also interesting that when testicular cancer survivors were asked to describe their baseline sexual functioning twice (firstly before start of treatment, secondly at the time of study), they evaluated their baseline sexual functioning worse at the time of study than they did before the diagnosis [30]. This finding could not be supported by our prospective results, that mainly showed significant, but not clinically relevant deterioration.

The positive findings of this study was that sexual functioning appeared to have improved 1 year after orchiectomy and that the decreases found were not clinically relevant. Men in a relationship even reported more intercourse satisfaction than norms. The fact that patients in a relationship experienced similar functioning as the norm group consisting of much older men, and that single patients reported worse functioning than men in the norm group is the reason for concern however. Earlier studies showed that impaired sexual functioning appears to remain prevalent in approximately 15% of long-term testicular cancer survivors [40]. We found that one of the possible risk factors for sexual problems was being single. This knowledge could facilitate offering information and possible guidance to those who need it the most. Up to two-thirds of testicular cancer patients still experience a strong need for information concerning sexuality and one-fifth experienced a need for support on this matter, even longer after treatment [41]. However, many men find talking about genitally related health problems difficult [42]. Health-care workers should pay extra attention to single testicular cancer patients, as they appeared more vulnerable to experiencing sexual problems in the first year after diagnosis.

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